

SS 1608B ECS SAT COMMUNICATION LINK PROCEDURE

SATORP Jubail Export Refinery Project

Invensys Ref: ME85009
Invensys Process Systems

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00	06-Jan-2012	Issued for Acceptance

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HOLD NUMBER	SECTION	DATE ENTERED	CHANGE ORDER NUMBER	DESCRIPTION	DATE CLEARED

Reference Documents

Invensys Documents

2271-PCS-PRJ-002	PCS System Development Plan
2271-PCS-PRJ-005	PCS Project Quality Plan
2271-PCS-FDS-001	PCS Networks & Cyber Security FDS
2271-PCS-FDS-002	PCS Cabinets FDS
2271-PCS-FDS-003	TMR Systems – ESD, FGS & CCS FDS
2271-PCS-FDS-004	PCS Communication Interfaces FDS
2271-PCS-FDS-005	PCS Database Structure and Transfer Methodology FDS
2271-PCS-FDS-006	DCS & ECS Systems FDS
2271-PCS-FDS-007	Operator Training Simulator FDS
2271-PCS-FDS-008	Machine Condition Monitoring FDS
2271-PCS-FDS-009	Process Monitoring CCTV FDS
2271-PCS-FDS-010	PCS Alarm Management FDS
2271-PCS-FDS-011	Blending and Material Movements - Refinery Offsite Management Solution Suite FDS
2271-PCS-FDS-012	PCS Asset Management FDS
2271-PCS-FDS-013	PCS Human Interface FDS
2271-PCS-FDS-014	DAHS, PCS Historian and Reports FDS
2271-PCS-FDS-015	Maintenance Training System FDS
2271-PCS-FDS-016	PCS Integrated Control Software FDS
2271-PCS-FDS-017	Advanced Process Control FDS
2271-PCS-FDS-018	Pipe Line Monitoring and Control FDS
2271-PCS-FDS-019	ESD TMR Systems FDS
2271-PCS-FDS-020	F&G TMR Systems FDS
2271-PCS-FDS-021	CCS TMR Systems FDS
2271-PCS-FDS-022	PCS Control Strategies FDS
2271-PCS-PHC-001	PCS Power & Heat Calculation Template.
2271-PCS-ITP-001	PCS FAT and IFAT Plan
2271-PCS-ITF-001	Inspection and Test Form Template – DCS and ECS Systems
2271-PCS-ITF-002	Inspection and Test Form Template – TMR systems
2271-PCS-ITF-003	Inspection and Test Form Template – MMS Systems
2271-PCS-ITF-004	Inspection and Test Form Template – CCTV Systems
2271-PCS-ITF-005	Inspection and Test Form Template – OTS and BLM Systems

Invensys Drawings

2271-PCS-ARC-001	PCS Architecture
2271-PCS-ARC-002	PCS Network Drawings
2271-PCS-CAB-001	PCS Cabinet Drawings
2271-PCS-CAB-002	PCS Cabinet Block Diagram
2271-PCS-TWS-001	PCS Typical Wiring Schematics
2271-PCS-TIW-001	PCS Typical Internal Wiring Schematics

Jubail Export Refinery Engineering Standards

JERES-B-058	Emergency Shutdown, Isolation and Depressuring
JERES-J-003	Basic Design Criteria
JERES-J-005	Instrument Drawings and Forms
JERES-J-601	Emergency Shutdown and Isolation Systems
JERES-J-602	BMS, Combustion and Waterside Control Systems for Water Tube Boilers
JERES-J-603	Process Heater Safety Systems
JERES-J-604	Protective & Condition Monitoring Eq. for Rotating Machinery
JERES-J-801	Control Buildings
JERES-J-902	Electrical System for Instrumentation
JERES-J-903	Intrinsically Safe System
JERES-P-127	Electrical Control System
JERES-T-625	Inter & Intra Building Fibre Optic Communication Cables
JERES-Z-001	Process Control System
JERES-Z-003	Pipeline Leak Detection Systems
JERES-Z-010	Process Automation Networks Connectivity

Jubail Export Refinery Materials Specifications

JERMS-J-4623	Programmable Controller Based ESD Systems
JERMS-J-4625	Machinery Protection System
JERMS-J-4634	Local ZV Control Systems
JERMS-J-4716	Pneumatic Actuators On-Off Service
JERMS-J-4813	Instrumentation & Thermocouples Cables
JERMS-J-4820	Instrument Control Cabinets – Indoor
JERMS-T-8625	Fibre Optic Cable Specification
JERMS-Z-3010	Distributed Control System
JERMS-Z-3020	Supervisory Control and Data Acquisition (SCADA) Systems
JERMS-Z-3030	Remote Terminal Units

Jubail Export Refinery Engineering Procedures

JEREP-111	Instrument Database Management
JEREP-112	SmartPlant Instrumentation User Guide
JEREP-200	Document Management & Final Documentation Requirements
JEREP-624	Preparation of System Design Documents
JEREP-626	Configuration and Graphics Guidelines
JEREP-634	Factory Acceptance Test
JEREP-636	Installation and Checkout Plan
JEREP-638	Site Acceptance Test
JEREP-640	Process Automation Networks & Systems Security

Jubail Export Refinery Project Procedures

2271-AAA-JSM-201	Item Numbering and Coding Procedure
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General Design Rules (Job Specification – Design)

2271-AAA-JSD-1500-01	JSD for Instrumentation & Automation (Guidelines for EPC Bidding)
2271-AAA-JSD-1500-02	JSD for Instrumentation & Automation
2271-AAA-JSD-1501-01	JSD for Instrument Numbering
2271-AAA-JSD-1522-01	JSD for Instrument/ Electrical Interface
2271-AAA-JSD-1540-01	JSD for Instrumentation
2271-AAA-JSD-1560-01	JSD for Analyzer Maintenance and Data System (AMDS)
2271-AAA-JSD-1570-01	JSD for Installation and Testing of Instr. & CTRL Systems
2271-AAA-JSD-1580-01	JSD for Packages Instrumentation
2271-AAA-JSD-1900-03	Design Safety Concept
2271-701-JSD-1510-01	JSD for Control & Safety System Philosophy
2271-701-JSD-1510-02	JSD for Control & Safety System Philosophy for OSBL Marine Terminal
2271-701-JSD-1510-03	JSD for Asset Management System (AMS)
2271-701-JSD-1510-04	JSD for Data Acquisition and Historization System (DAHS)
2271-701-JSD-1510-05	JSD for Maintenance Training Simulator (MTS)
2271-701-JSD-1510-07	JSD for Alarm Management System (ALMS)
2271-701-JSD-1518-02	JSD for Operator Training Simulator (OTS)

General Supply Rules (Job Specification – Supply)

2271-701-JSS-1510-01	JSS for PCS Functional Specification
2271-701-JSS-1510-02	JSS for PCS Vendor Services
2271-701-JSS-1510-03	JSS for PCS Configuration Guidelines
2271-701-JSS-1515-01	JSS for ESD System
2271-701-JSS-1515-02	JSS for CCS System
2271-701-JSS-1515-03	JSS for Process Closed Circuit Television System (CCTV)
2271-701-JSS-1515-04	JSS for Fire & Gas System
2271-AAA-JSS-1516-01	JSS for Tank Gauging System (TGS)
2271-AAA-JSS-1563-01	JSS for Corrosion Monitoring System (CRMS)

General Supply Rules (Job Specification – Drawings)

2271-701-DW-1512-001	ISBL Control and Safety Systems Connection Diagram
2271-701-DW-1512-002	PCS Architecture Block Diagram
2271-701-DW-1512-003	ISBL FO Cable Block Diagram
2271-701-DW-1512-005	PCS Architecture Block Diagram OSBL
2271-701-DW-1512-006	OSBL FO Cable Block Diagram
2271-701-DW-1522-001	Instrument Power Supply Distribution Typical Single Line Diagram

Non Material (NM Specification)

2271-AAA-NM-1500-01	Instrumentation & Control System EPC Contractors Responsibility Matrix
2271-AAA-NM-1500-02	Instrumentation & Control System EPC Contractors Cabling Interface Points

Reference Web Sites

- Invensys Triconex System – www.triconex.com/
- Invensys Foxboro I/A System – www.foxboro.com/
- FDT Group – www.fdtgroup.org

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Glossary

General project abbreviations and system terminology are listed below, with specific abbreviations identified in the text of each section.

ALMS	Alarm Management System
AMDS	Analyser Maintenance and Data System
AMS	Asset Management System
APM	Advance Process Monitoring
BLM	Basic Learning Model
BOSS	Blend Optimisation and Supervisory System
BPD	Barrels Per Day
BPO	Blend Plan Optimisation
BTM	Batch Tracking Manager
C&E	Cause and Effect
CCS	Compressor Control System
CCTV	Closed Circuit Television
CDR	Critical Design Review
DAHS	Data Acquisition and Historian System
DCS	Distributed Control System
DDS	Detailed Design Specification
ECS	Electrical Control System
EPC	Engineering Procurement Construction
ESD	Emergency Shutdown System
CCS	Fire and Gas
FAT	Factory Acceptance Test
FDS	Functional Design Specification
FEED	Front End Engineering Design
FGS	Fire and Gas System
FOB	Free On Board
FOD	Field Operator Display
HMI	Human Machine Interface
HSE	Health Safety Environmental
HW	Hardware
I/A	Intelligent Automation
I/O	Input Output
IC	Initial Condition (file defining process state)
ICT	Invensys Core Team
IET	Invensys Local EPC Team

IFA	Issued For Approval
IFAT	Integrated Factory Acceptance Test
IPS	Invensys Process Systems
ITP	Inspection and Test Plan
JER	Jubail Export Refinery
JEREP	Jubail export Refinery Engineering Procedures
JERES	Jubail Export Refinery Engineering Standards
JERMS	Jubail Export Refinery Materials Specifications
JSD	Job Specification Design
JSS	Job Specification Supply
KOM	Kick Off Meeting
MCC	Motor Control Centre
MMS	Machine Maintenance System
MOM	Minutes of Meeting
MP	Main Processor
MTS	Maintenance Training System
MVT	OTS (Process) Model Validation Test
NCR	Non Conformance Report
NMR	Non Material Requisition
NTP	Network Time Protocol
OMM	Order Movement Management
OSBL	Out Side Battery Limits
OTS	Operator Training Simulator
OGC	Operator Group Console
P&ID	Process and Instrumentation Diagram
PAT	Performance Acceptance Test
PCS	Process Control System
PDR	Preliminary Design Review
PEFS	Process Engineering Flow Scheme
PFD	Process Flow Diagram
PLC	Programmable Logic Controller
PMT	Programme Management Team
QA	Quality Assurance
QC	Quality Control
SAT	Site Acceptance Test
SATORP	Saudi Aramco and Total Refinery and Petrochemical SATORP
SCADA	Supervisory Control And Data Acquisition
SCT	SATORP PCS Core Team
SDD	System Design Document

SDP	System Development Plan
SET	SATORP EPC Team
SIL	Safety Integrity Level
SOE	Sequence of Events
SRR	System Readiness Review
TCM	Triconex Communication Module
TGS	Tank Gauging System
TIS	Tank Information System
TMC	Turbo Machinery Control
TMR	Triple Modular Redundant
TQ	Technical Query
TR	Test Report
TRX	Triconex
UCP	Unit Control Panel
VMS	Vibration Monitoring System
WBS	Work Breakdown Structure

1 Introduction

1.1 Purpose and Scope

The purpose of this SAT Procedure - Communication Links is to accurately inspect and test the serial links between all the sub system Package PLCs and prove the functionality is in accordance with SATORP/ EPC approved PCS Vendor documents.

1.2 Communication Links

The scope and purpose of this test is to validate the serial interface hardware and software configuration in both the PLC and the DCS. This test case does not include control narrative based applications, such tests will be covered separately. The test will also verify the serial link operational philosophy detailed in the Communication Interfaces FDS, 2271-PCS-FDS-004.

Serial Link subsystem will be physically connected to DCS equipment in order to prove the communications between the systems.

The SAT will involve testing from the PLC through to the DCS HMI. The following shall be tested as part of the SAT test procedure:

Delete any tests completed during FAT, except for hardware tests (redundancy test, watchdog)

- PLC serial interface configuration set-up check
- PLC serial data type check
- Redundancy checks applicable to the PLC interface
- Function block tests applicable to the PLC interface
- Serial Interface 100% Point Database Check
- DCS graphics applicable to the PLC – dynamic configuration check
- DCS/PLC operation with respect to the DCS/PLC signal
- Alarm generation and alarm acknowledgement
- Time synchronisation
- Watchdogs/Heartbeats
- IT PLCN network functions such as file transfer and printing
- Monitor and record serial link bandwidth utilisation and data traffic
- Complete Serial Link Configuration Document

Copies of the DCS and PLC software will be taken as a test record on completion of the test protocol.

1.3 Test Equipment

The following test equipments shall be kept ready for use during Test. A valid calibration certificate shall be produced along with the test equipment for verification prior to test.

- Program Workstations with programming software
- Multi Meter
- Wiring Tools (Screw Driver, wire stripper etc)
- Serial converter RS-232/422/485 (2 wire and 4 wire ready)

1.4 Prerequisites

All the SERIAL LINK NAME shall have completed the Installation and Check out phase and the Installation Certificate completed.

Start up spares and test equipment available.

SAT Schedule completed by EPC.

Required personnel specified by EPC are available for the expected duration of the SAT.

Safety Procedures in place and all personnel inducted and aware.

PCS Vendor As Built documentation for the SERIAL LINK NAME available.

PLC Vendor As Built documentation for the SERIAL LINK NAME available.

1.5 PCS Vendor Personnel and Responsibilities

Team Members responsibilities are as follows:

Team Member	Responsibilities
Project Manager	Overall responsibility for the Project.
Test Team Supervisor	Test supervision. Focal point for test issues.
Quality Manager (Part)	Responsible for ensuring the quality and handling quality related issues.
Test Executor(s)	PCS Vendor engineer in charge of particular tests (Software).
Test Executor(s)	PCS Vendor engineer in charge of particular tests (Hardware).
Technical Support	Hardware and Software specialists for specific technical issues.
PCS Core Team	Technical Authority and Review of Global TRs

One team member may be allocated multiple duties as applicable.

1.6 EPC Personnel Requirements and Responsibilities

EPC shall assign the following personnel to the test team.

Team Member	Responsibilities
Project Engineer	Responsible for the SAT on behalf of EPC An engineer with delegated approval authority on behalf of EPC. Responsible for review and approval of test documentation. Responsible for SAT acceptance.
Package Inspector	Responsible for system hardware inspection.
Test Engineers	Responsible for the testing, witnessing and participating in the SAT as directed by the respective test Team Co-ordinator.

One team member may be allocated multiple duties as applicable.

Note: One of the above personnel must have authority for accepting the PCS system on behalf of the EPC designated approving authority, and shall be named prior to start of SAT.

1.7 Test Schedule

The project SAT phase will be detailed in the EPC Site Activities Schedule. A detailed schedule will be provided, indicating required resource levels and parallel tasks being performed. PCS Vendor will provide indicative resource requirements against the EPC SAT Schedule during development, when requested by EPC.

1.8 Test Documentation Sign Off

After completion of each test, the PCS Vendor and SATORP/EPCs engineers shall sign the appropriate sign-off sheet within the SAT Procedures document. Any supplementary literature – initialled Interface and Connection Schedules etc. shall be filed with the SAT procedure for future reference.

A Test Report (TR) database (Exception List) shall be maintained by PCS Vendor during installation and check out. All problems that have occurred, equipment shortages, system deficiencies and other observations shall be recorded. Each TR shall be passed to the respective Installation Supervisor to decide on the corrective action. Signed off copies of the TR sheets and summary sheet shall be collated with the Test Procedures document for future reference. A sample Test Report sheet is provided in the appendices.

On completion of all tests, the SATORP/EPCs approving authorities will be required to sign-off the SAT Completion Certificate, subject to any TRs.

1.9 Test Completion

On completion of the SAT, the SATORP/EPCs approving Engineers will sign a Completion of SAT Certificate. Any outstanding non-conformance will be recorded on this certificate, with a view to completion within an agreed period.

2 Serial Device Interface Setup

Objective Outline:

The purpose of this procedure is to test and confirm the PLC interface setup is as per the SATORP/ EPC approved PCS Vendor documents.

Criteria:

There should not be any abnormalities with respect to serial interface setup.

Test Procedure:

1. Confirm that the PLC set up for Hardware and Software complies with the suppliers documents in Attachments E & F.
2. PLC representative shall demonstrate the working of the PLC test platform and that the communication port is working.

Serial Device Interface Setup		
PASS/FAIL CRITERIA	SAT	Comments
Attachment E and F verified.	<input type="checkbox"/>	
PLC platform on line and communication port is functioning.	<input type="checkbox"/>	

Serial Device Interface Setup

A: System Identification

DCS Area	:	DCS Area 3
Location	:	SS 1608B & Serial Link Name

B: Reference Documents

Title	Invensys Document No.	Revision No
DCS & ECS Systems FDS	2271-PCS-FDS-006	Rev XX
PCS Architecture Drawings	2271-PCS-ARC-001	Rev XX
Communication Interface FDS	2271-PCS-FDS-004	Rev XX
PIB/SS Interconnecting Block Diagram	SA-JER-PIAAA-PIXJ-060201	Rev 03

C: Tested

Tested By (Invensys personnel):		
Print Name	Signature	Date DD/MM/YY

D: Comments

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E: SATORP Witness

Witnessed By (SATORP personnel):		
Print Name	Signature	Date DD/MM/YY

F: EPC Acceptance

Accepted By (EPC personnel):		
Print Name	Signature	Date DD/MM/YY

3 Serial Interface Communication Test

Objective Outline:

The purpose of this procedure is to test and confirm the sub system serial interface communication functionality is as per the SATORP/ EPC approved PCS Vendor documents.

Criteria:

There should not be any abnormalities with respect to Serial Interface Communication functionality.

Test Procedure:

1. Connect the DCS and PLC platforms in accordance with reference documents like Communication Interface FDS and System Architecture. Where ever necessary make the appropriate adjustments to protocol settings to achieve satisfactory communications between the test platforms.
2. Confirm that the DCS configuration and settings including screen capture, comply with the documents in attachment G.
3. Confirm that the PLC configuration and settings, including screen capture, comply with the documents in attachment H.

Note: This information will be used to update the Serial Interface Configuration document

Serial Interface Communication Test		
PASS/FAIL CRITERIA	SAT	Comments
DCS System Manager displays the PLC interface on line and healthy.	<input type="checkbox"/>	
Attachment G verified.	<input type="checkbox"/>	
Attachment H verified.	<input type="checkbox"/>	

Serial Interface Communication Test

A: System Identification

DCS Area	:	DCS Area 3
Location	:	SS 1608B & SERIAL LINK NAME

B: Reference Documents

Title	Invensys Document No.	Revision No
DCS & ECS Systems FDS	2271-PCS-FDS-006	Rev XX
PCS Architecture Drawings	2271-PCS-ARC-001	Rev XX
Communication Interface FDS	2271-PCS-FDS-004	Rev XX
PIB/SS Interconnecting Block Diagram	SA-JER-PIAAA-PIXJ-060201	Rev 03

C: Tested

Tested By (Invensys personnel):		
Print Name	Signature	Date DD/MM/YY

D: Comments

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E: SATORP Witness

Witnessed By (SATORP personnel):		
Print Name	Signature	Date DD/MM/YY

F: EPC Acceptance

Accepted By (EPC personnel):		
Print Name	Signature	Date DD/MM/YY

4 Serial Data Type Test

Objective Outline:

The purpose of this procedure is to test and confirm the Serial Data type functionality is as per the SATORP/ EPC approved PCS Vendor documents.

Criteria:

There should not be any abnormalities with respect to Serial Data Type functionality.

Test Procedure:

1. Confirm that a single DCS Analogue Input software block displays the correct value when the corresponding output is manipulated from the high limit to the low limit from the PLC.
2. Confirm that a single DCS Digital Input software block displays the correct value when the corresponding output is toggled from the PLC.
3. Confirm that a single DCS Analogue Output value is correct at the corresponding PLC input as the DCS Analogue Output is manipulated from the high limit to the low limit from the DCS.
4. Confirm that a single DCS Digital Output value is correct at the corresponding PLC serial point as the DCS Digital Output is toggled from the DCS.

Serial Data Type Test		
PASS/FAIL CRITERIA	SAT	Comments
DCS Analogue Input software block displays the same value as the corresponding PLC serial point.	<input type="checkbox"/>	
DCS Digital Input software block displays the same value as the corresponding PLC serial point.	<input type="checkbox"/>	
PLC reads the DCS Analogue Output as it is manipulated from the DCS.	<input type="checkbox"/>	
PLC reads the DCS Digital Output as it is manipulated from the DCS.	<input type="checkbox"/>	

Serial Data Type Test

A: System Identification

DCS Area	:	DCS Area 3
Location	:	SS 1608B & SERIAL LINK NAME

B: Reference Documents

Title	Invensys Document No.	Revision No
DCS & ECS Systems FDS	2271-PCS-FDS-006	Rev XX
PCS Architecture Drawings	2271-PCS-ARC-001	Rev XX
Communication Interface FDS	2271-PCS-FDS-004	Rev XX
PIB/SS Interconnecting Block Diagram	SA-JER-PIAAA-PIXJ-060201	Rev 03

C: Tested

Tested By (Invensys personnel):		
Print Name	Signature	Date DD/MM/YY

D: Comments

--

E: SATORP Witness

Witnessed By (SATORP personnel):		
Print Name	Signature	Date DD/MM/YY

F: EPC Acceptance

Accepted By (EPC personnel):		
Print Name	Signature	Date DD/MM/YY

5 Point Database, Graphics and Function Block Check

Objective Outline:

The purpose of this procedure is to test and confirm the Serial point database, Graphic dynamics and Function Blocks functionality are as per the SATORP/ EPC approved PCS Vendor documents.

Criteria:

There should not be any abnormalities with respect to Point Database, Graphics and Function Blocks functionality.

Test Procedure:

1. Check the DCS serial interface database with respect to Attachment B: PLC Serial Link Schedule. Produce screen captures of all graphics listed in Attachment D: DCS Graphics Applicable to the PLC.
2. Using the Interface PLC Serial Link Schedule manipulate each point from the PLC and sign of the point in the Interface PLC Serial Link Schedule as it changes in the DCS.
3. Check and sign each serial point for inclusion on the correct DCS graphic. The PLC Serial Link Schedule may contain points that are not required on a display.
4. If the redundant link operates with a dual PLC database then perform a set of checks on the secondary.
5. Confirm the list of applicable Function block test cases are included C.
6. Complete Function block test cases.

Point Database, Graphics and Function Block Check		
PASS/FAIL CRITERIA	SAT	Comments
Attachment B and Attachment D verified.	<input type="checkbox"/>	
All points listed in PLC Interface I/O Check Report are correctly configured in the DCS.	<input type="checkbox"/>	
All dynamic update points are signed off.	<input type="checkbox"/>	
Attachment C verified.	<input type="checkbox"/>	
Function block test cases are completed without error. This will include any control of handover, SP tracking and bumpless transfer if applicable	<input type="checkbox"/>	

Point Database, Graphics and Function Block Check

A: System Identification

DCS Area	:	DCS Area 3
Location	:	SS 1608B & SERIAL LINK NAME

B: Reference Documents

Title	Invensys Document No.	Revision No
DCS & ECS Systems FDS	2271-PCS-FDS-006	Rev XX
PCS Architecture Drawings	2271-PCS-ARC-001	Rev XX
Communication Interface FDS	2271-PCS-FDS-004	Rev XX
PIB/SS Interconnecting Block Diagram	SA-JER-PIAAA-PIXJ-060201	Rev 03

C: Tested

Tested By (Invensys personnel):

Print Name	Signature	Date DD/MM/YY

D: Comments

--

E: SATORP Witness

Witnessed By (SATORP personnel):

Print Name	Signature	Date DD/MM/YY

F: EPC Acceptance

Accepted By (EPC personnel):

Print Name	Signature	Date DD/MM/YY

6 Link Simplex & Failure Test

Objective Outline:

The purpose of this procedure is to test and confirm the serial link Simplex and failure functionality is as per the SATORP/ EPC approved PCS Vendor documents.

Criteria:

There should not be any abnormalities with respect to serial link redundancy and failure functionality.

Test Procedure:

Link Simplex

1. For link A as primary disconnect the cable from either end.
2. Confirm data is transferred via the secondary link. Confirm both DCS and PLC report the failure of the primary.
3. Reconnect the link and acknowledge alarms.
4. Change primary selection from the System Manager.

Link Failure

1. Disconnect the cable from either end of the link.
2. Reconnect the link and acknowledge alarms.
3. Fail additional hardware (applicable converters, server etc.) by removing power to the device.
4. Return power to device, acknowledge alarms and make any online selections that are needed.

Link Simplex and Failure Test		
PASS/FAIL CRITERIA	SAT	Comments
Link Simplex After disconnecting the primary link: Confirm data is transferred via the secondary link and both DCS and PLC report the failure of the primary.	<input type="checkbox"/>	
After reconnect the link and acknowledge alarms Confirm communications is recovered.	<input type="checkbox"/>	
Change primary selection from the System Manager. After disconnecting the primary link: Confirm data is transferred via the secondary link and both DCS and PLC report the failure of the primary	<input type="checkbox"/>	
After reconnect the link and acknowledge alarms Confirm communications is recovered.	<input type="checkbox"/>	
Link Failure After Disconnecting the cable from either end of the primary link: Confirm both DCS and PLC report the failure. Of the primary serial link	<input type="checkbox"/>	
After reconnecting the link and acknowledge alarms: Confirm communications is recovered.	<input type="checkbox"/>	
After Disconnecting the cable from either end of the redundant link: Confirm both DCS and PLC report the failure of the redundant serial link.	<input type="checkbox"/>	
After reconnecting the link and acknowledge alarms: Confirm communications is recovered	<input type="checkbox"/>	
Redundant Link performs as required.	<input type="checkbox"/>	

Link Simplex and Failure Test

A: System Identification

DCS Area	:	DCS Area 3
Location	:	SS 1608B & SERIAL LINK NAME

B: Reference Documents

Title	Invensys Document No.	Revision No
DCS & ECS Systems FDS	2271-PCS-FDS-006	Rev XX
PCS Architecture Drawings	2271-PCS-ARC-001	Rev XX
Communication Interface FDS	2271-PCS-FDS-004	Rev XX
PIB/SS Interconnecting Block Diagram	SA-JER-PIAAA-PIXJ-060201	Rev 03

C: Tested

Tested By (Invensys personnel):

Print Name	Signature	Date DD/MM/YY

D: Comments

--

E: SATORP Witness

Witnessed By (SATORP personnel):

Print Name	Signature	Date DD/MM/YY

F: EPC Acceptance

Accepted By (EPC personnel):

Print Name	Signature	Date DD/MM/YY

7 Alarm Generation and Acknowledgement

<This Section Needs to be edited if the Serial Link has no Remote/Local Operation as per the Communication Interfaces FDS>

Objective Outline:

The purpose of this procedure is to test and confirm the alarm generation and acknowledgement on serial interface is functioning as per the SATORP/ EPC approved PCS Vendor documents.

Criteria:

There should not be any abnormalities with respect to other alarm and acknowledgement functionality.

Test Procedure:

1. Put the Remote/Local Signal into Remote (DCS Control).
2. Generate an alarm at the PLC.
3. If PLC does not run an automatic acknowledgement then Request acknowledge from the DCS.
4. Clear alarm at the PLC.

Alarm Generation and Acknowledgement		
PASS/FAIL CRITERIA	SAT	Comments
Alarm/warning appears in DCS.	<input type="checkbox"/>	
Alarm/Warning shown as acknowledged at the DCS.	<input type="checkbox"/>	
Alarm/Warning shown as acknowledged at the PLC.	<input type="checkbox"/>	
Alarm/Warning cleared on both ICCS and PLC.	<input type="checkbox"/>	
Alarm/Warning description, priority, colour are implemented appropriately.	<input type="checkbox"/>	

Alarm Generation and Acknowledgement

A: System Identification

DCS Area	:	DCS Area 3
Location	:	SS 1608B & SERIAL LINK NAME

B: Reference Documents

Title	Invensys Document No.	Revision No
DCS & ECS Systems FDS	2271-PCS-FDS-006	Rev XX
PCS Architecture Drawings	2271-PCS-ARC-001	Rev XX
Communication Interface FDS	2271-PCS-FDS-004	Rev XX
PIB/SS Interconnecting Block Diagram	SA-JER-PIAAA-PIXJ-060201	Rev 03

C: Tested

Tested By (Invensys personnel):		
Print Name	Signature	Date DD/MM/YY

D: Comments

--

E: SATORP Witness

Witnessed By (SATORP personnel):		
Print Name	Signature	Date DD/MM/YY

F: EPC Acceptance

Accepted By (EPC personnel):		
Print Name	Signature	Date DD/MM/YY

8 Administration Utility Function Test

<This Section Needs to be Deleted if the Serial Link has no Workstation and Connection to the PLCN>

Objective Outline:

The purpose of this procedure is to test and confirm the utility functions like printing and file transfer are performed as per the SATORP/ EPC approved PCS Vendor documents.

Criteria:

There should not be any abnormalities with respect to other printing and file transfer functionality.

Test Procedure:

1. From the PLC Workstation Select an ASCII text file for printing.
2. Print the file on a PLCN Printer.
3. From the PLC select a file for transfer to the PLCN Backup Server.

Administration Utility Function Test		
PASS/FAIL CRITERIA	SAT	Comments
ASCII text file is printed to the PLCN printer.	<input type="checkbox"/>	
File is transferred to PLCN Backup Server without corruption.	<input type="checkbox"/>	

Administration Utility Function Test

A: System Identification

DCS Area	:	DCS Area 3
Location	:	SS 1608B & SERIAL LINK NAME

B: Reference Documents

Title	Invensys Document No.	Revision No
DCS & ECS Systems FDS	2271-PCS-FDS-006	Rev XX
PCS Architecture Drawings	2271-PCS-ARC-001	Rev XX
Communication Interface FDS	2271-PCS-FDS-004	Rev XX
PIB/SS Interconnecting Block Diagram	SA-JER-PIAAA-PIXJ-060201	Rev03

C: Tested

Tested By (Invensys personnel):

Print Name	Signature	Date DD/MM/YY

D: Comments

--

E: SATORP Witness

Witnessed By (SATORP personnel):

Print Name	Signature	Date DD/MM/YY

F: EPC Acceptance

Accepted By (EPC personnel):

Print Name	Signature	Date DD/MM/YY

9 Data Traffic Test

Objective Outline:

The purpose of this procedure is to test and confirm the data traffic is healthy.

Criteria:

There should not be any abnormalities with respect to the data traffic.

Test Procedure:

1. From the DCS System Manager reset the counter registers.
2. Leave the link running for 24 hours.

Data Traffic Test		
PASS/FAIL CRITERIA	SAT	Comments
No communication overruns have occurred as viewed in System Manager.	<input type="checkbox"/>	

Data Traffic Test

A: System Identification

DCS Area	:	DCS Area 3
Location	:	SS 1608B & SERIAL LINK NAME

B: Reference Documents

Title	Invensys Document No.	Revision No
DCS & ECS Systems FDS	2271-PCS-FDS-006	Rev XX
PCS Architecture Drawings	2271-PCS-ARC-001	Rev XX
Communication Interface FDS	2271-PCS-FDS-004	Rev XX
PIB/SS Interconnecting Block Diagram	SA-JER-PIAAA-PIXJ-060201	Rev 03

C: Tested

Tested By (Invensys personnel):		
Print Name	Signature	Date DD/MM/YY

D: Comments

--

E: SATORP Witness

Witnessed By (SATORP personnel):		
Print Name	Signature	Date DD/MM/YY

F: EPC Acceptance

Accepted By (EPC personnel):		
Print Name	Signature	Date DD/MM/YY

10 Completion of Communication Links SAT Certificate

DCS Area DCS Area 3

Location: SS 1608B & SERIAL LINK NAME

Test Details

SAT Location:

SAT Start Date

SAT Completion Date:

Upon completion of the test.

- ☐ Ensure all master Invensys drawings / documents are marked up and are ready for redrafting
- ☐ Ensure all punch list items are either closed or transferred to the exception list
- ☐ Ensure SATORP/ EPC have signed off on Test Report and Test Certificates
- ☐ Ensure all design input documents are marked up and copied. Attach signed Test Certificates.

Completion of SAT Test Certificate

COMMENTS:	<hr/>		
	<hr/>		
	<hr/>		
WITNESSED BY :	<hr/>	<hr/>	<hr/>
	Invensys	SATORP	EPC
DATE :	<hr/>		

APPENDIX A: TEST REPORT

TR Number: _____ Unit: _____ Delete: SAT

Originator _____ Date: _____

1) Fault/Issue Found

2) Action Required

3) Test to be Performed

4) Action Taken

Feedback to Engineering Team: Yes / No By: _____ Date: ____/____/____

PCS System Affected: (Tick One)	Fault/Issue: (Tick One)	Fault Due To: (Tick One)	Importance: (Tick One)
TMR : <input type="checkbox"/> ESD <input type="checkbox"/> F&G <input type="checkbox"/> CCS <input type="checkbox"/> BMS <input type="checkbox"/> Safety PLC	Others : <input type="checkbox"/> DCS <input type="checkbox"/> ECS <input type="checkbox"/> MMS <input type="checkbox"/> CCTV <input type="checkbox"/> OTS	<input type="checkbox"/> System Hardware <input type="checkbox"/> Cabinets <input type="checkbox"/> Cables <input type="checkbox"/> Graphic <input type="checkbox"/> Function Blocks <input type="checkbox"/> Logic/Control Narrative <input type="checkbox"/> Alarms <input type="checkbox"/> Database	<input type="checkbox"/> Global Impact <input type="checkbox"/> EPC Interface Issue <input type="checkbox"/> Both of the Above
		EPC <input type="checkbox"/> Change SATORP <input type="checkbox"/> Change Invensys <input type="checkbox"/> Change <input type="checkbox"/> Error <input type="checkbox"/> Product Issue	

Corrected by Invensys:	Checked by Invensys:	Accepted by EPC:	Witnessed / Accepted by SATORP :
TQ Ref: _____	_____	_____	_____
	** Invensys Safety Authority:		

Date: ____/____/____	Date: ____/____/____	Date: ____/____/____	Date: ____/____/____

**** Invensys Safety Authority to Check ALL TMR System Test Reports.**

APPENDIX B: PLC SERIAL LINK DATABASE LISTING

Please attach copies of the Serial Link Database listing.

APPENDIX D: DCS GRAPHICS APPLICABLE TO THE PLC

Please record DCS graphics applicable to the serial interface and attach copies of the graphics.

DCS Graphics	Graphic Revision and Date

APPENDIX E: RECORD OF PLC SUPPLIER DOCUMENTS

Please record vendors document details if applicable. Attach copies of documents if necessary.

PLC Supplier Document Title and Number	Document Revision and Date

APPENDIX F: RECORD OF PLC HARDWARE & SOFTWARE DETAILS/SERIAL NUMBERS

Please record vendor's hardware and software details if applicable. Attach copies of documents if necessary.

Hardware/Software Title / Part Number	Revision Number/Serial Number

APPENDIX G: CONFIGURATION & SETTINGS FOR THE DCS INTERFACE

Insert screen capture of the DCS interface configuration settings.

APPENDIX H: CONFIGURATION & SETTINGS FOR THE PLC TEST PLATFORM

Insert screen capture of the PLC test platform configuration settings.